

# **QUALITY ASSURANCE PROJECT PLAN**

**Version 1.0**

Rockford, Illinois, Semi-continuous Ambient Lead Investigation

Prepared by:

Motria Caudill  
U.S. EPA Region 5  
Air and Radiation Division

May 6, 2014

## **SECTION A – PROJECT MANAGEMENT**

### **A.1 Title of Plan and Approval**

#### **Quality Assurance Project Plan Rockford, Illinois Semi-continuous Ambient Lead Investigation**

\_\_\_\_\_ Date: \_\_\_\_\_

Motria Caudill, US EPA Region 5, Project Manager / Principal Investigator

\_\_\_\_\_ Date: \_\_\_\_\_

Scott Hamilton, US EPA Region 5, Field Operations Manager

\_\_\_\_\_ Date: \_\_\_\_\_

Bilal Qazzaz, US EPA Region 5, Quality Assurance Coordinator

\_\_\_\_\_ Date: \_\_\_\_\_

Loretta Lehrman, US EPA Region 5, Quality Assurance Manager

## **A.2 Table of Contents**

<b>SECTION A – PROJECT MANAGEMENT .....</b>	<b>2</b>
A.1 Title of Plan and Approval.....	2
A.2 Table of Contents.....	3
A.3 Distribution List.....	5
A.4 Project/Task Organization .....	5
A.5 Problem Definition/Background .....	5
A.6 Project/Task Description.....	7
A.7 Quality Objectives & Criteria .....	7
A.8 Special Training/Certification .....	7
A.9 Documents and Records .....	8
 <b>SECTION B – DATA GENERATION &amp; ACQUISITION .....</b>	 <b>9</b>
B.1 Sampling Process Design (Experimental Design) .....	9
B.2 Sampling Methods .....	9
B.3 Sampling Handling & Custody.....	9
B.4 Analytical Methods .....	9
B.5 Quality Control.....	10
B.6 Instrument/Equipment Testing, Inspection, and Maintenance .....	10
B.7 Instrument/Equipment Calibration and Frequency.....	11
B.8 Inspection/Acceptance of Supplies & Consumables .....	11
B.9 Data Management .....	11
 <b>SECTION C – ASSESSMENT AND OVERSIGHT .....</b>	 <b>12</b>
C.1 Assessments and Response Actions .....	12
C.2 Reports to Management.....	12

**SECTION D – DATA VALIDATION AND USABILITY** ..... 13

D.1 Data Review, Verification, and Validation ..... 13

D.2 Verification and Validation Methods..... 13

D.3 Reconciliation with User Requirements ..... 13

**APPENDICES**

**Appendix A** Standard Operating Procedure for the Operation of the Xact Semi-continuous Metals Monitoring Trailer .....14

**Appendix B** Site Visit Schedule for Rockford, Illinois, Lead Investigation .....15

**Appendix C** Wind Speed and Direction Calibration Forms .....16

**List of Tables**

**Table A.1** Roles & Responsibilities.....5

**Table A.2** List of Methods and Target Analytes.....9

**List of Figures**

**Figure A.1** Organization Chart.....5

**Figure A.2** Study Map.....6

**Figure A.3** Rockford, Illinois, Spring Season Wind Roses.....6

### A.3 Distribution List

Motria Caudill, USEPA Region 5

Scott Hamilton, USEPA Region 5

Bilal Qazzaz, USEPA Region 5

Loretta Lehrman, USEPA Region 5

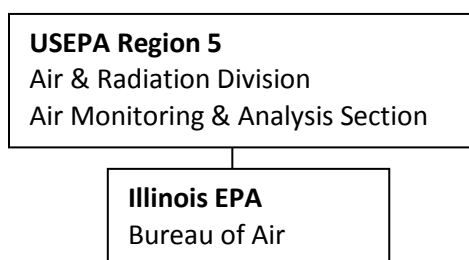
Field Operator, Illinois EPA

### A.4 Project/Task Organization

**Table A.1 Roles & Responsibilities**

<b>Individual(s) Assigned</b>	<b>Responsible for:</b>	<b>Authorized to:</b>
Motria Caudill	<ul style="list-style-type: none"> <li>Principal Investigator</li> <li>QAPP revisions, data analysis, report preparation</li> </ul>	<ul style="list-style-type: none"> <li>Communicate findings to EPA and IEPA</li> </ul>
Scott Hamilton	<ul style="list-style-type: none"> <li>Field Operations</li> <li>Train IEPA field staff</li> <li>QC on field sampling</li> </ul>	<ul style="list-style-type: none"> <li>Collect data</li> <li>Communicate with IEPA</li> </ul>
Bilal Qazzaz	<ul style="list-style-type: none"> <li>QAPP review</li> <li>Data validation</li> </ul>	<ul style="list-style-type: none"> <li>Determine whether DQOs are met</li> </ul>
Loretta Lehrman	<ul style="list-style-type: none"> <li>QAPP approval</li> <li>Data package approval</li> </ul>	

**Figure A.1 Organization Chart**



### A.5 Problem Definition/Background

Joseph Behr & Sons in Rockford, IL, is a scrap metal recycling facility. As shown on Figure A.2, there are residences, parks, and commercial properties adjacent. USEPA Region 5 enforcement engineers have inspected the facility and consider there to be potential for community exposure to ambient Pb concentrations above the National Ambient Air Quality Standard. There is no historic air monitoring in

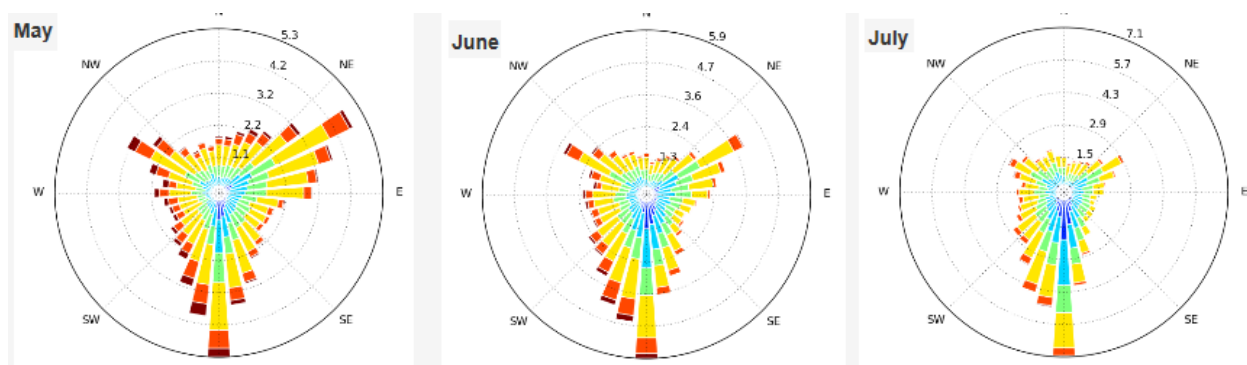
the area. If it appears that Behr has the potential to violate the NAAQS, then EPA will require the company install a long-term TSP-FRM monitoring station.

**Figure A.2. Study Map**



Below on Figure A.3 are wind roses produced using hourly meteorological data from the Rockford Airport during the month of May, June, and July. Winds during this period are variable and increasingly from the south and southwest. The proposed monitoring site on Figure A.2 is expected to be downwind of the source during a significant portion of the study.

**Figure A.3 Rockford, Illinois, Spring season wind roses**



## **A.6 Project/Task Description**

Three months of semi-continuous metals monitoring, May through July 2014, will allow characterization of current exposures to Pb in the community. The Xact™ Fenceline Monitor provides TSP concentrations in 1-hour increments for 23 metals and trace elements via built-in XRF analysis. The metals monitor is collocated with a meteorological station.

## **A.7 Quality Objectives & Criteria**

The main objective of monitoring in Rockford is to determine whether local residents are potentially exposed to Pb above NAAQS levels. A secondary objective is to characterize ambient levels of other toxic metals, including manganese, nickel, cadmium, and arsenic.

An exceedance of the Pb NAAQS is defined as an average concentration above  $154 \text{ ng/m}^3$  over a 3-month period. Lead is measured with a Federal Reference Method total suspended particulates (TSP) sampler, which operates on a standard 1-in-6 day schedule, and the filter must be analyzed in a laboratory via approved EPA methods. Three years of data are needed to designate an area as attaining the NAAQS. These requirements will not be met by the semi-continuous monitor and data from this study will not be usable to officially designate nonattainment of the NAAQS.

Semi-continuous Pb monitoring will be less conservative (less protective) than official EPA Pb methods in that it is a short-term study that may not capture peak Pb exposures over a 3-year period. To compensate for this, Pb concentrations well below the NAAQS will be considered an indication of the potential for an exceedance in the long-term. For the sake of this study the criteria for further action are: 1) the Pb average for the full study period is over  $35 \text{ ng/m}^3$  or 2) the Pb average for any 24-hour period is over  $350 \text{ ng/m}^3$ .

If the following criteria are met, the hourly metals data will be considered of sufficient quantity and quality:

- (1) Data completeness is 75%, or 1500 samples, over a 90 day period;
- (2) MDLs for toxic metals, in  $\text{ng/m}^3$ , are as follows:
  - Arsenic – 0.051
  - Lead – 0.099
  - Manganese – 0.077
  - Nickel – 0.083
  - Chromium – 0.092
  - Cadmium – 1.138
  - Mercury – 0.0912
- (3) Sufficient samples are collected when the predominant wind direction is from the source(s) in question.

## **A.8 Special Training/Certification**

Personnel working on this monitoring system must meet minimum training requirements for safety and technical expertise. Minimum technical training shall include at least 5 years of prior experience in the field of ambient air monitoring and on site hands on training with the Xact monitoring trailer project lead.

## **A.9 Documents and Records**

The principal investigator (PI) will have responsibility to ensure all QAPP revisions are shared with project participants. Each revision of the QAPP will be numbered and dated.

A site notebook will be kept at the monitoring station. The notebook will contain the appropriate data forms for routine operations as well as inspection and maintenance forms and SOPs. Additional notes, such as weather conditions, will be noted whenever the site technician arrives. Site operators may also elect to utilize the onsite computer for electronic logbooks and data forms.

Electronic data collection – In order to reduce the potential for data entry errors, automated systems will be utilized where appropriate and will record the same information that is found on data entry forms. In order to provide a back-up, a hardcopy of automated data collection information will be stored for the appropriate time frame in project files.

This QAPP and the Xact™ O+M manual will be kept in the monitoring shelter at all times. Additional copies will be kept at the field operations headquarters if the field copies are misplaced.

The PI will create a database for the sample results which will be used during data analysis. This database will be archived and retained for 5 years.

The PI will write the final report, which will summarize the details of the samples collected, the results of the analysis of those samples, outline the analysis performed, and the final conclusions/recommendations.



## SECTION B – DATA GENERATION & ACQUISITION

### B.1 Sampling Process Design (Experimental Design)

Three months of monitoring in Rockford, May through July 2014, may determine whether local residents are potentially exposed to Pb above NAAQS levels and characterize ambient levels of other toxic metals, including manganese, nickel, cadmium, and arsenic.

### B.2 Sampling Methods

The Xact™ 625 instrument is a semi-continuous instrument that collects and reports data on an hourly time scale and will be averaged into 1-hour data sets. The sampling period will be approximately 90 days.

Site specific meteorological parameters that will be measured consist of wind speed and direction data. The sonic anemometer was provided by EPA Region 5 and is of sufficient quality for its intended use.

Standard Operating Procedures – the field operators will follow the operations and maintenance (O+M) manuals for the Xact™ instrument.

### B.3 Sampling Handling & Custody

The Xact™ collects and analyzes samples within the same instrument; the user does not touch the filter tape except to load a roll of clean tape and remove a roll of sampled tape. Handling of the filter tape requires no special preparation procedures. The field operator will be responsible for loading and unloading the tape. There are no temperatures or holding time requirements for the 24-hour integrated samples or the Xact™ samples. For the Xact™ instrument, there are no sample handling or custody issues. The document “Standard Operating Procedure for the Operation of the Xact Semi-continuous Metals Monitoring Trailer” is provided in Appendix A.

### B.4 Analytical Methods

The Xact system is designed for monitoring ambient air near the fence lines of industrial facilities and in complex urban environments, where particulate matter and metal concentrations are elevated. The system uses reel-to-reel (RTR) filter tape sampling and nondestructive X-ray fluorescence (XRF) analysis to monitor ambient air. The air is sampled through a total suspended particulates (TSP) size-selective inlet and drawn through a filter tape. The resulting PM deposit is automatically advanced and analyzed by XRF for selected metals at the same time that the next sample is collected. The analysis is based on EPA Method IO 3.3: Determination of metals in ambient PM using XRF.

**Table A-2 List of Methods and Target Analytes**

Target Analytes	Method
Pb and HAPs Metals	X-Ray fluorescence
Meteorology	Sonic Anemometry (wind speed and direction vector and scalar data) Ambient Temperature Relative Humidity

## **B.5 Quality Control**

Detailed information on the instruments used in the field can be obtained in the Xact O+M Manual and Standard Operating Procedure for the Operation of the Xact Semi-continuous Metals Monitoring Trailer in Appendix A.

QA/QC for data collected from the Xact™ includes an initial calibration check, automatic daily checks of the instrument's flow measurement, automatic daily upscale and zero drift checks for the instrument's mass measurement, and mass sensor stability checks with every sample.

The initial calibration check is conducted once prior to sampling and at least quarterly. Flow measurement and upscale are conducted during a daily 30-minute QA/QC period, and the results of these checks are incorporated in the dataset collected from the Xact™ by a field technician. Sensor stability is checked with every sample and results of these checks are also incorporated in the Xact™ dataset. Details of these procedures may be found in the Standard Operating Procedure for the Operation of the Xact Semi-continuous Metals Monitoring Trailer in Appendix A and the Xact Operating Manuals.

The stability evaluation check is conducted during every sample. For this check, the XRF sensor analyzes a rod with containing a reference value of palladium. The measured mass of palladium must be within 5% of the reference value of palladium to pass the stability check.

All Measurement Quality Objectives are summarized in Section 10.1 of the Standard Operating Procedure for the Operation of the Xact Semi-continuous Metals Monitoring Trailer in Appendix A.

A schedule for QA/QC activities is provided in Appendix B "Site Visit Schedule for Rockford Xact Project".

## **B.6 Instrument/Equipment Testing, Inspection, and Maintenance**

The field operators will perform routine external and internal leak checks and temperature, pressure and flow rate verification checks. If any of these checks are out of specification, the field technicians will attempt to correct them or perform the appropriate calibration. If the problem still cannot be resolved the field manager will contact the vendor for guidance. After any failure additional checks will be completed and if the sampling instrument meets the acceptance criteria, it will be assumed to be operating properly.

The Xact™ requires minimal maintenance and its consistency in operation is assured by review and comparison with QA/QC criteria listed in the previous section. As an additional diagnostic tool, field staff will monitor the pressure drop below the filter tape on a daily basis to ensure there is no tape leakage.

There are several items to inspect in the field before and after a sample has been taken. There are also many items associated with appropriate preventive maintenance of a successful field program. Please refer to the Xact™ O+M manual and the Standard Operating Procedure for the Operation of the Xact Semi-continuous Metals Monitoring Trailer in Appendix A. The meteorological system is operated per "Wind Speed and Direction Calibration Forms", as presented in Appendix C.

### **B.7 Instrument/Equipment Calibration and Frequency**

The Xact XRF calibration checks are conducted once prior to sampling and at least quarterly. This procedure will not need to be repeated during the course of this deployment. Other calibrations are performed according to the Table in Section 10.1 of the Standard Operating Procedure for the Operation of the Xact Semi-continuous Metals Monitoring Trailer in Appendix A.

### **B.8 Inspection/Acceptance of Supplies & Consumables**

Upon receipt of the Xact sample tape, field staff will visually inspect the media to look for any damage that may have occurred during shipping.

### **B.9 Data Management**

Data generated in the field by the Xact™ will be collected by the field technician via remote computer access. Data may also be collected directly from the Xact computer in the monitoring trailer. Data will be checked by Field Ops Manager to ensure they meet with the QA/QC standards set forth in this QAPP. Quality-assured data will be put into a MS Excel database by the technician at their office location.

The QA Coordinator will quality assure the data, ensuring that the data is valid, and then pass the data on to the principle investigator. The PI will then consolidate the results into a database for analysis. This data, and the analysis, will be included in the final report.

## **SECTION C – ASSESSMENT AND OVERSIGHT**

### **C.1 Assessments and Response Actions**

An assessment is defined as an evaluation process used to measure the performance or effectiveness of the quality system or the establishment of the monitoring network and sites and various measurement phases of the data operation. The results of quality assurance assessments indicate whether the control efforts are adequate or need to be improved. Documentation of all quality assurance and quality control efforts implemented during the data collection, analysis, and reporting phases is important to data users, who can then consider the impact of these control efforts on the data quality. In order to ensure the adequate performance of the quality system, the following assessments will be performed:

- Network siting and review. The EPA QA Manager reviewed siting criteria for the metals trailer prior to the beginning of the program.

### **C.2 Reports to Management**

The principal investigator (PI) will summarize data results monthly and will write the final report. The monthly summaries will address performance evaluation and audits, as well as data quality assessments. The final report will consolidate QA findings and address the primary study questions. The PI will provide monthly and final reports to management within U.S. EPA Region 5.

## **SECTION D – DATA VALIDATION AND USABILITY**

### **D.1 Data Review, Verification, and Validation**

Prior to performing any statistical calculations, the reported data from chain of custody forms are checked to ensure accurate transcription. This requirement does not apply to the Xact datasets, as they are remotely downloaded and physical samples are not handled.

### **D.2 Verification and Validation Methods**

At least 10% of the database is checked to verify its validity. Items checked include original data sheets, checks of all calculations (from calibration to sample analysis), and data transfers. As the data are checked, corrections are made to the database as errors or omissions are encountered. If errors are located, all of the data is checked to verify data quality. Documentation of equipment and instrument calibration and other procedures are detailed in the laboratory's SOPs.

### **D.3 Reconciliation with User Requirements**

Per the DQOs in Section A.7, data will be rejected if MDLs for toxic metals are not met. The PI will conduct a preliminary data review to uncover potential limitations to using the data, to reveal outliers, and generally to explore the basic structure of the data. The first step is to calculate basic summary statistics, generate graphical presentations of the data, and review these summary statistics and graphs. The PI will calculate statistics for toxic metal completeness and precision. Data will be qualified and used if criteria for completeness and precision are not met.

## **Appendix A**

### **Standard Operating Procedure for the Operation of the Xact Semi-continuous Metals Monitoring Trailer**

## **Appendix B**

### **Site Visit Schedule for Rockford, Illinois, Lead Investigation**

## **Appendix C**

### **Wind Speed and Direction Calibration Forms**